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PRELIMINARY INVESTIGATIONS OF FUEL CLOUD FORMATION IN FUEL TANK ULLAGE

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ABSTRACT

A cloud of suspended fuel droplets may be formed from fuel vapor in an essentially empty center wing fuel tank. Two situations conducive to droplet formation by homogenous nucleation may occur often enough in fuel tanks that they warrant investigation: 1) diabatic decompression of the ullage space, typically encountered whenever an aircraft climbs over an extended period such as at take-off; and 2) situations where the fuel residue in the bottom of a tank is at a higher temperature than the top surface of the tank, typically encountered when the aircraft sits on the ground on a hot day with the air conditioning running in the passenger compartment. Little is known about tank vapor dynamics related to the stability of aerosols formed in aircraft fuel systems. Preliminary details of experimental investigations on the formation of suspended fuel droplets in a large temperature-, pressure- regulated fuel tank segment with optical access for PDPA measurement of droplet size distribution and density are reported.